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ABSTRACT

This report is an edited version of the transcript of a seminar held to explore the problem of increasing costs and defining productivity in higher education. The main paper, by William Massey, presents a conceptual model explaining the forces driving up costs in academic departments of institutions of higher education. Under the model there have been increases in curriculum specialization and unsponsored research activity and declines in curriculum structure and the quality of undergraduate teaching. The paper recommends changes in structure, curriculum, and financial incentives. Indicators, discussed and illustrated with graphs, show that costs per student are going up; tuition and fees are rising faster than inflation; and state appropriations have not kept up with costs. Five reasons for cost increases some familiar and some not, are: regulation and micro-management; "cost disease"; "growth force"; "organizational slack"; and "output creep." Output creep is analyzed in terms of process dynamics, winners and losers, the ratchet relationship between teaching load and departmental research, destructuring the curriculum, and curriculum structure and cost. Four necessary conditions for change are identified: strategic thinking; incentives, recognition, rewards; individual and group empowerment; and firm constraints on available resources. State higher education executive officers are encouraged to stress growth by substitution; link incentives to substitution; empower institutions and avoid micro-management; and be as clear as possible about future resource availability. A reaction by Robert Zemsky and a discussion are included. (DB)

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The Dynamics of Academic Productivity

SHEEO
State Higher Education Executive Officers

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The Dynamics of Academic Productivity

A seminar sponsored by the
State Higher Education Executive Officers

with
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Vice President for Finance
Director, Stanford Institute for
Higher Education Research
Stanford University

and

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March 2, 1990
Denver, Colorado

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The State Higher Education Executive Officers is a nonprofit, nationwide association of the chief executive officers serving statewide coordinating boards and governing boards of postsecondary education. Fifty states, the District of Columbia, Puerto Rio and the Canadian province of Quebec are members.

Foreword

There is a persistent problem that nags at higher education. It is the increasing cost of the enterprise, and in the views of some observers, its declining effectiveness, especially with undergraduates. In the words of one of the participants of our seminar, "Students seem to be paying more and getting less."

To understand the dynamics which had led to declining productivity in higher education, we asked William Massy of Stanford University to present to us his model of the forces operating in academic departments in the modern university. He and his colleague, Robert Zemsky of the University of Pennsylvania, provide a powerful explanation of why and how costs are increasing and what we are getting in return. In terms of outputs of academic departments, the "gainers" have been curriculum specialization and unsponsored research activity; the losers, structure in the curriculum and the quality of undergraduate teaching.

Massy and Zemsky, along with the members of the SHEEO Task Force on Financing and Accountability, present some exciting and challenging ideas for remedying this situation. Changes in structure, in curriculum, in financial incentives are all needed if we are to focus faculty and departments on the pressing needs at hand.

This report is an edited version of the transcript of the March seminar. An informal style of presentation and discussion has been maintained, rather than that of a polished narrative.

I would like to thank all who contributed to this thoughtful and thought-provoking seminar -- especially Clyde Ingle, SHEEO president, who conceived the idea, and David Longanecker, chair of the committee and seminar leader. On behalf of them and the entire membership of SHEEO we extend our special thanks to Bill Massy and Bob Zemsky for their outstanding work in this field.

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The Dynamics of Academic Productivity

William F. Massy

My purpose here is to describe a conceptual model that explains the forces driving up costs in academic departments. There also is a problem on the administrative side but I want to concentrate my remarks today on the academic side -- both the teaching part of it and the research part.

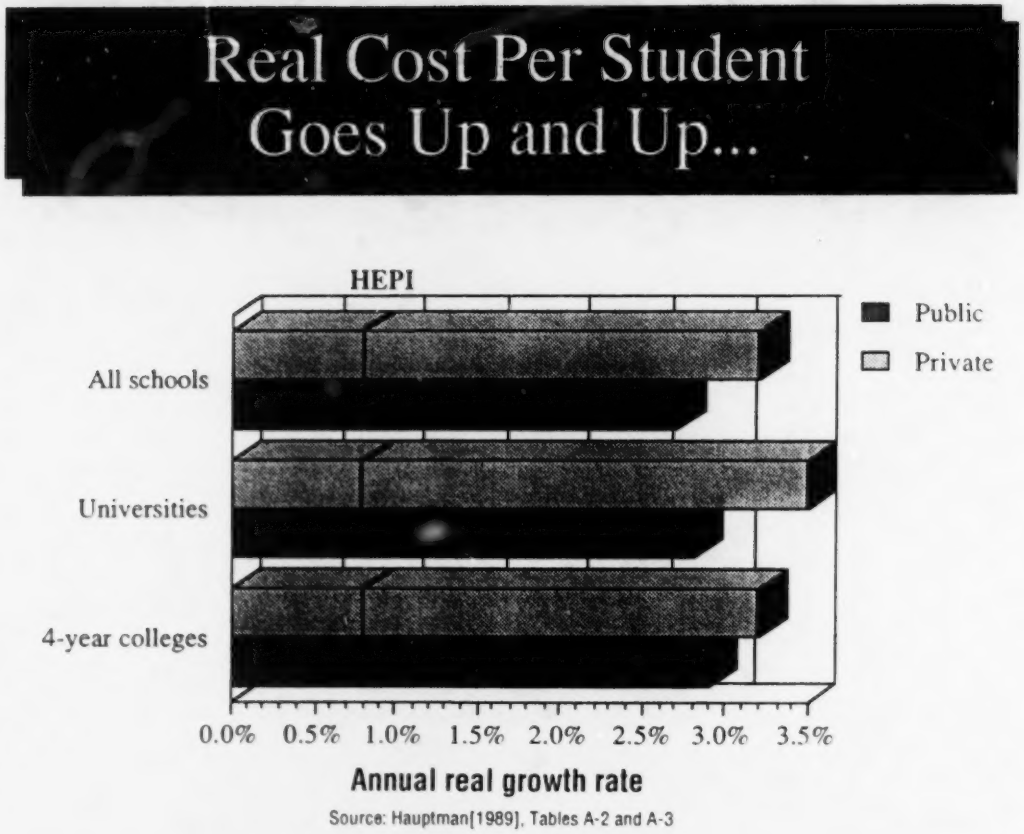
Costs per Student Are Going Up (Figure 1)

Figure 1 displays the cost per student in real terms. The costs for public universities are going up in the vicinity of 2.8-2.9% annually and about 3.5% in the privates. Remember this is over and above the Consumer Price Index. It is a little bit less than that for private four-year colleges. These increases are even more dramatic considering that the Higher Education Price Index (HEPI) only grew at about 8/10 of a percent over the CPI for this period. We can see that there is substantial real growth in costs and that it is real both relative to the CPI and relative to our own internal price index.

Tuition and Fees Rising Faster than Inflation (Figure 2)

We are all familiar with what has been happening in the area of tuition. The media has been increasingly dwelling on this and it shows no sign of abating. In Figure 2 the median is in the center, the 75th percentile of the distribution is at the top of the box, the 25th percentile is at the bottom. These figures are over and above the CPI again, so you can see that in private AAU institutions the median has been rising at about 6% over and above inflation for the period from 1980-1988.

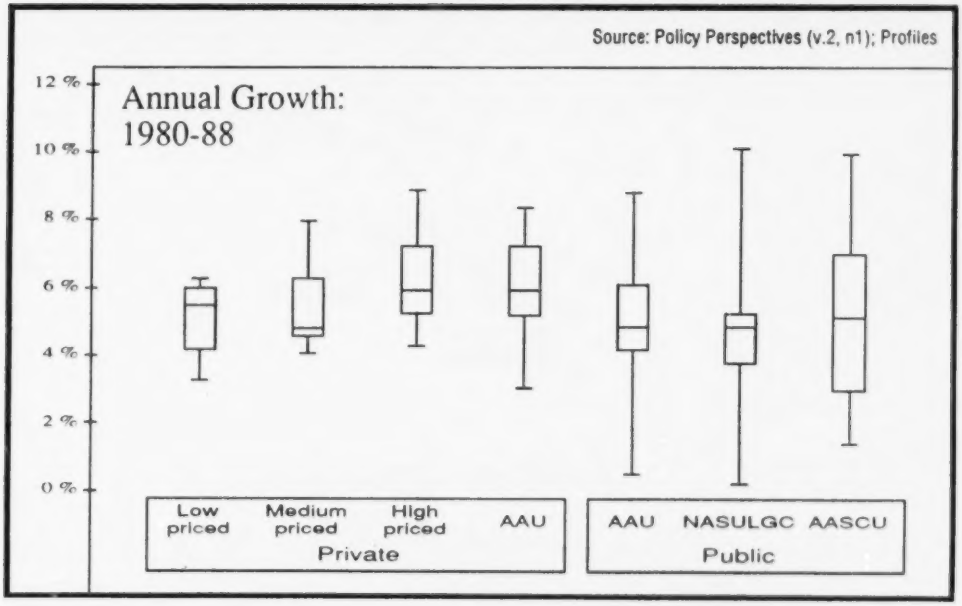
Figure 1



Source: Hauptman[1989], Tables A-2 and A-3

Figure 2

Tuition and Fees Have Been Rising Faster Than Inflation



The publics are a little bit less, but still substantial. The public median tuition has grown at a rate of 4.6 or 4.7%. Interestingly enough, the private high-priced colleges (the Williams, the Bryn Mawrs, the Carletons, and others) are virtually the same as the publics. Now the dollars are less but the growth rates have been about the same. This is pretty strong evidence that private elites are providing a price umbrella.

State Appropriations Have Not Kept Up (Figure 3)

On the public side, state appropriations have not been keeping up. Figure 3 shows the median annual increase in state appropriations at about 0.5% for the AAU institutions, a little more for the others. That's quite a bit lower than the numbers for tuition and fees. Obviously, there has been less growth of expenditure in the publics than in the privates. We saw that on the previous figure. But there has been significant cost increase in both sectors, public and private, and that's what our session today is all about.

Why Do Costs Increase? (Figure 4)

Why do costs increase? We believe there are five reasons. Some of them are familiar. Obviously, one reason that costs are increasing is more regulation and micro-management. Certainly it has increased in the 10 or 12 years that I have been vice president for finance at Stanford. We can all tell our war stories about that. Stanford's legal department has increased by a factor of four or five during that period. In health and safety, the factor probably is close to ten and we're still not keeping up. These activities are all very important but they consume resources. On the state level, there is always the problem of micro-management. Regulation and micro-management add transaction costs to the system and that is certainly one reason why costs increase.

Figure 3

...But State Appropriations Haven't Kept Up

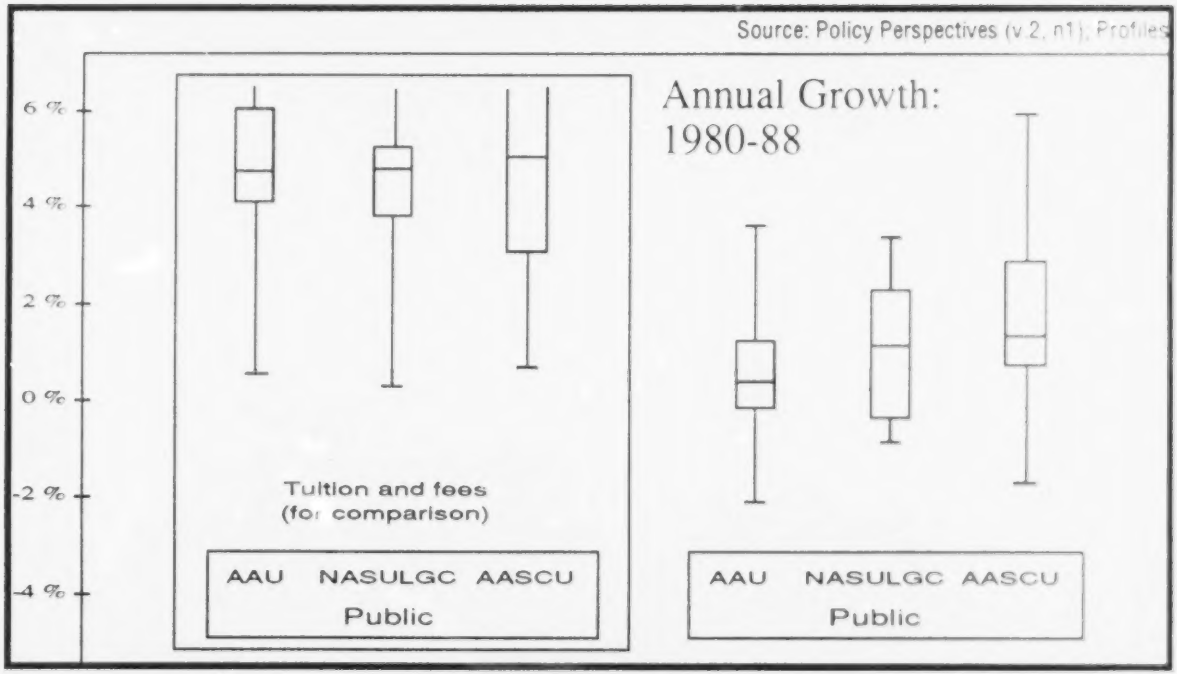


Figure 4

Why Do Costs Increase?

- Regulation and micro-management
- Cost disease
- Growth force
- Organizational slack
- Output creep

In my judgement, however, you cannot account for the cost increases described earlier simply by pointing to regulation and micro-management. There is a second, third, and fourth reason. Several years ago people started talking about the "cost disease," something that is endemic to higher education. The argument goes like this. You have a labor-intensive organization that cannot get quantitative productivity increases the way steel mills can or automobile factories can. There may be quality improvements, but quantitative productivity may change little if at all as measured by student-faculty ratios. It may be 15 to 1 today, the same as it was ten years ago.

But what has happened to costs in the meantime? Faculty have received real salary increases during that ten-year period. And they do that because the labor market in the country as a whole is producing real cost increases related to productivity improvement. In order to maintain competitive labor markets, higher education institutions must meet those cost increases. That drives costs up.

The analogy may be to a string quartet. You have to keep paying your musicians more or less the market rate but you can't really get a productivity increase in your string quartet. It takes two man-hours to play a piece scored for thirty minutes, and yes, you can speed it up a bit but quality gets hurt in the process. Even though everybody knows you don't need the second violin, it's pretty hard to get the guy out of the band.

This is the essence of the cost disease. The only trouble with the argument is that it applies to only a small part of what the university economy is all about. So it's true as far as it goes, but it doesn't go very far, and it doesn't nearly begin to explain all the cost increases in higher education.

Then there's something else called the "growth force." Donald Kennedy, president of Stanford, summed it up when he gave a speech at one of our alumni gatherings four or five years ago. "Why do we look so rich yet feel so poor?" he asked. The answer is because we

always want to do more. The thing about a college or university, a good one anyway, is that the faculty always have an agenda of good and useful things to do. There is always a slew of things to do, and you never have enough time to do them all. And, in fact, as a university officer for many years, I would say that at any time in our university when the faculty did not have a queue of unmet things to do, I'd want to get a new faculty. We pay them for an unending stream of good ideas. So we're always pressing against that budget constraint and we always feel poor no matter what our growth rate is. There is always more to be done.

What happens, of course, is that pressure is never ending and it pushes on price and costs in every possible way. Again, one of the reasons it is never-ending is that knowledge is not only infinite in its potential but, in fact, the periphery expands. The state-of-the-art moves out. There is more literature to compare every decade. There is more science to be understood. Furthermore, the tools get more expensive. It costs more to push that frontier out so you're working against some very strong forces. I call it the life force of the university. A good university has a lot of life force and while it sometimes comes out in ways that we don't like, we wouldn't like it if it didn't exist either. We would be in despair if we didn't have that life force.

The trouble is, I have made these arguments for ten years or fifteen years now to the Stanford Board of Trustees. Until recently, they would nod and understand, and they would sign off on an increased budget and increase the tuition. Now they aren't doing it anymore.

Organizational slack is another reason for cost increases. That's a term that comes from Cyert and March (The Behavioral Theory of the Firm). It is a technical term to an economist or an organizational behavior person. It's not all bad but the connotation is bad. ("Prof-scam" was about organizational slack.) In fact, the good sense of the word is that there are resources available for creativity. You don't manage everything so tightly that people are not able to turn around. You decentralize. If people have a good idea and they

have the resources to pursue it, they can get something done. So there is certainly "slack" in the system. Maybe it has increased, maybe it has decreased. The theory of the firm says that when times are good, slack increases and people are able to be more creative and do more creative things. But with slack comes excess baggage. When times get hard and the slack is squeezed out, you become lean and mean. When times get better, it builds up again. Every organization goes through a cycle. We in higher education are not immune to that.

At Stanford we recently announced a $22 million budget reduction program from a base of $300 million. We're squeezing out our slack at the moment, but we had a ten-year run where we built it up pretty nicely. I don't believe, however, that the bad part of organizational slack is the fundamental problem, because this is the sort of stuff that does get squeezed out when you go through the down cycle.

Output Creep: The Trade-Offs (Figure 5)

The real issue, the one that we can do something about, is "output creep." What is the output of academic departments? What activities are the gainers and losers in output creep? The gainers in academic departments in recent years have been increased curriculum scope and increased specialization of the curriculum. Increased scope means more coverage of the discipline, if you will. Instead of teaching all of history from the beginning of time until the present day in one course, it is subdivided. As you subdivide it into narrower specialties, you are in effect increasing scope. You are covering more of each part. With that comes specialization. You have more of a division of labor and that has increased over time.

Figure 5

Output Creep: The Trade-offs

- Gainers:
  - curriculum scope and specialization
  - departmental research
- Losers:
  - curriculum structure
  - teaching quality
  - advising, mentoring, tutoring

The other output that has been increasing is departmental research. That is to say, the research that is paid for by the institution out of general funds but which is research and scholarship. (I'll use the term "research" as a shorthand for both.) Sponsored research has increased over the long term (post World War II) but in recent years it has remained relatively flat in real terms and may even be declining. This change, plus the dynamics that I will describe in a minute, have been squeezing some of this activity off on to departments. I remember meeting with the director of the National Science Foundation and asking, "Don't you and your colleague (that was still in the Reagan administration days), Bill Bennett, ever talk to each other? Because you're telling us that NSF wants to shove as many of these joint costs of teaching and research off on the teaching side as you possibly can, and in fact, you want to go even further."

So, while Bill Bennett was bashing us on tuition, NSF was bashing us on cost-sharing. There has been great pressure from the federal government to shift resources from the teaching side to the departmental research side. As Aims McGuinness has noted, there is a growing sense that undergraduates are paying more and may be getting less.

If there are gainers, there must be some losers. This is a zero sum game. Most faculty, certainly at the upper echelon institutions, work very hard. They lead full, complicated lives. They are not on the golf course. Rather, they are working at something or other and if they're doing more of one thing, they must be doing less of something else.

We think that what it is they're doing less of relates to changes in the curriculum. There certainly is less structure in the curriculum than there was 20, 30, 40 years ago. This is especially true in the humanities and social sciences. The quality and attention to undergraduate teaching in many institutions has eroded as has advising, mentoring and tutoring. This is certainly the case in research universities and in those institutions with which I'm familiar that aspire to be research universities.

Output Creep: Process Dynamics (Figure 6)

There are three dynamics that have affected output creep directly: (1) the pursuit of faculty billets; (2) the leveraging of faculty time; and (3) the propagation of property rights. Each is causing a drift toward specialization and more departmental research.

What is the pursuit of faculty billets? (A billet is a faculty line.) Faculty are valued not only for their instrumental qualities, i.e., that they provide research and teaching and ease the teaching loads of their colleagues. Faculty lines also appear to be intrinsically valued. Bob Zemsky uses a wonderful analogy which I have now adopted. Academic departments are like the medieval monastery. What is the fundamental objective of the medieval monastery? It is to get the resources to have more monks for the good of the order. More monks are intrinsically good. Talk to the average department chair -- and we have talked to a lot of them in our research -- and what is the bottom line in what they want? They want more faculty, for the most part. Sometimes they want a building or they talk about travel, but the fundamental thing that drives them is more faculty. And a lot of that is intrinsic value of the faculty member -- intellectual stimulation for the good of the order, if you will. That is a very powerful force that pushes the system, one that we have to recognize as we think about productivity.

Another factor that is operating is the desire to leverage faculty time. What do I mean by leveraging faculty time? Well, it's the classic response in service enterprises. You want to substitute lower-cost resources for higher-cost resources. Take for example law firms or consulting firms or accounting firms. It is no accident that there is a small army of associates that are supporting and performing the entry-level professional work that permits the partners to make large amounts of money. The partners' time is leveraged by these lower-cost people.

Figure 6

Output Creep: Process Dynamics

- Pursuit of faculty billets
- Leveraging faculty time
- Propagation of property rights
- ...Leads to "The Ratchet"

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Some would say the associates are being exploited. But they put up with it because they hope to be partners someday and they are paying their dues. In the academic world, it doesn't work quite that way. We do not exploit assistant professors the way law firms exploit. At least not in my shop. It is not as endemic as it is in law firms or accounting firms, or consulting firms. But there is still a strong desire to substitute teaching assistants, secretaries, and lab technicians for faculty. I do it. I can be more productive as an individual if I can leverage my time. I can do more of the things that are important to me and which I believe are important to the institution.

Then, of course, there is technology. People say all the time now that technology is adding cost and I think that's right. I now use computers in my course and I haven't cut expenses anywhere else, but there's the expense of the computers. But I can't teach decision analysis without them. How can you possibly do without technology these days? But I've leveraged my time there and I've taken it out in quality. I haven't taken it out in quantity. I don't teach more students (heaven forbid) since I added computers, but I produce more quality.

All of these dynamics do, in fact, work. They do increase the productivity of the faculty member. The only problem is that the increased leverage means the faculty have more time to do departmental research, more time to expand scope and specialize. It does not come out in reduced cost. You're getting productivity from this leverage, but it is not coming out in economic terms. There is no mechanism, no incentive in the department, to get it out in economic terms.

Finally, there is this matter of propagation of property rights. One form of property right is tenure, but even without tenure, faculty assume that they are entitled to a certain level of support. You do not give it up easily. It is your right because you are doing good things and the institution has contracted with you to do this. When improvements occur on any of

these dimensions, they are built in and the property right phenomenon keeps them sticky, holds them. That is what I mean by the ratchet. You can get things happening -- an increase in leverage, an extra billet, whatever it is -- and once it's in place, it's very hard to remove it because of this sense of property rights.

Where is the enforcement on property rights? These are not contracts in any formal sense, but the enforcement is through the senior faculty who are mobile. If, for example, there is a violation of equity, a violation of these rights, you start losing your key faculty. And if you are an institution that aspires to significance at whatever level, key faculty is the one thing you cannot afford to lose. There is a belief -- which is certainly true in the most elite institutions -- that it takes a generation to build up an excellent department but you can lose it in two or three years. And if you are a dean, you want to be ever so careful that the Department of Economics does not go from a top rank to a medium rank on your watch. If you are a dean, that is one of the worst things that can happen to you.

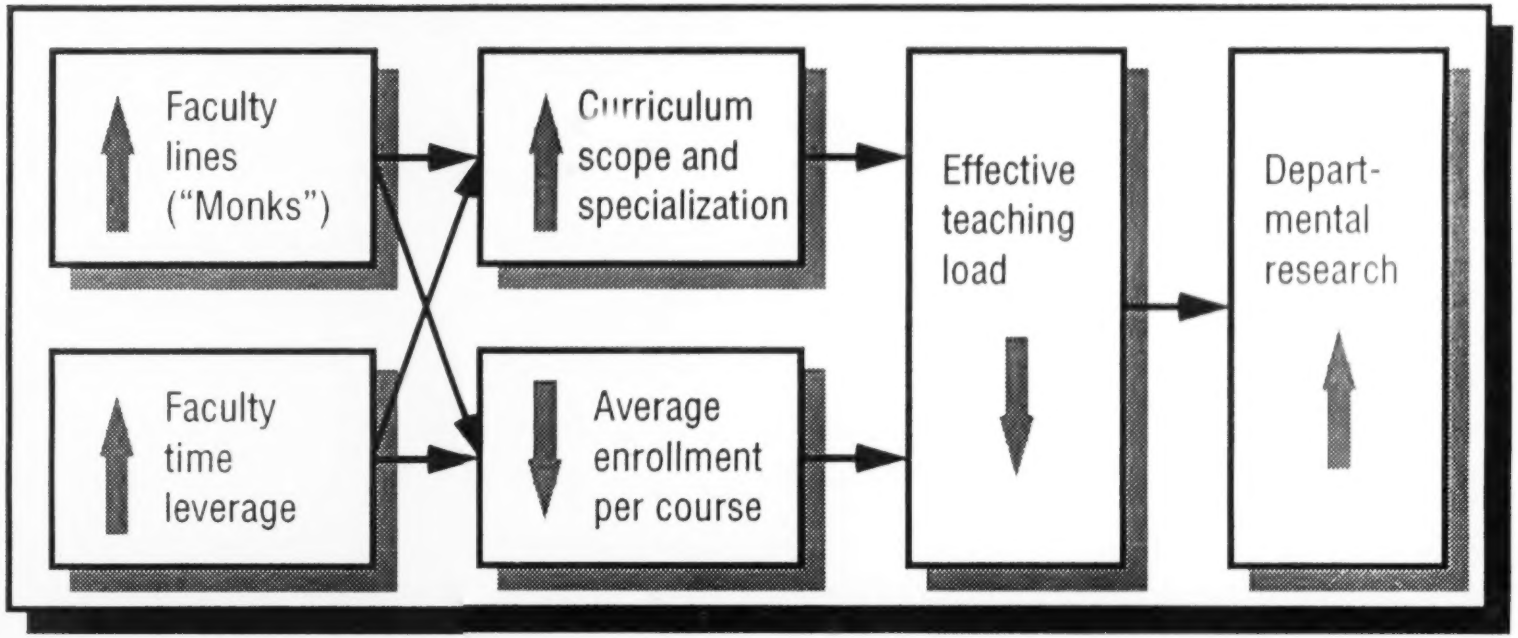
So these property rights are legitimized by the sense of equity in the system and enforced by the fact that your best faculty tend to be mobile. They can always go someplace else.

The Ratchet (Figure 7)

Let's look a little more at the process. This diagram works as follows: start with the idea of an increase in faculty lines. Suppose someone succeeds in making the case to a dean that he should get another monk. What is the effect of that? One of two things will happen. (I'm assuming there is no increase in enrollments.) Either there is an increase in curriculum scope and specialization and a decrease in average enrollment per course. Or there is a decrease in effective teaching load. Let's work through it step by step. If there is an extra faculty member and the faculty member comes in and teaches the normal complement of

Figure 7

Output Creep: "The Ratchet"



courses, that means existing enrollment is spread out. That's going to reduce average enrollment per course. And because there is a new course now, that's another niche in the curriculum being filled out. This is what I call scope or specialization -- the same thing. So these two things happen and together they have the effect of reducing effective teaching load. Why? Because first of all, it is easier to teach a course with smaller enrollments. Anybody who has taught will tell you that. Secondly, it is easier to teach a specialized course in your specialty. I'm going to teach a course in higher education this spring which will be a conversation between me and my graduate students and that's no work at all. It's fun. I teach a course in the fall in decision analysis. That's a lot of work, a lot more students and it's not as specialized. It's more general and I have to do a lot of preparation.

Now what happens when effective teaching load is reduced? You guessed it -- departmental research increases. Time freed up is not spent on the golf course. It is spent on what I am loosely calling departmental research. It is spent doing the activities that the faculty member believes are important to the department and his/her peers believe are important. That includes going to professional meetings and all that good stuff. But it's all part of the scholarly and research activity.

The same thing happens if you leverage faculty time. Suppose you get a new computer and it takes you less time as a professor to prepare for class. Or suppose you have a lab assistant or a TA or any of those things that we talked about. It's going to reduce your effective teaching load. It may involve changing the scope and specialization. If it increases scope and specialization, it will also decrease average enrollment per course. Whatever happens, though, however it works, it reduces your average teaching load which turns things into departmental research. This is the ratchet.

De-structuring the Curriculum (Figure 8)

There is another kind of output creep and that is de-structuring of the curriculum. By structure in the curriculum, Bob and I mean how courses connect with one another. In math, you cannot take advanced calculus without having had beginning calculus. You cannot take econometrics without having had matrix algebra. You just can't do it, it doesn't work. It's the same thing in science. In the humanities, one could imagine that you could not take the advanced history of something without having the first shot at it, but of course, in the humanities, it doesn't work that way so much anymore. The structure has systematically been leached out of the humanities and much of the social science curriculum.

Right now the curriculum is pretty flat. There are far fewer prerequisites in many fields than there used to be. For the student this means more choice. What it means to the faculty member is a lower effective teaching load. Why? Because you don't have to spend all that time in committee meetings deciding how your course is going to connect to everybody else's course (I include committee work as part of teaching load here). In the humanities where there are real value conflicts, you teach whatever you want. You have interesting lunchroom intellectual conversations about values but you don't have to hammer out a consensus that finds its way into the curriculum. It saves everybody's time.

The irony of the sixties was that de-structuring was started by students who wanted freedom and more choice, but it was the faculty who really benefited. Added freedom meant more time for departmental research, more scope and specialization, but not more coherence.

Figure 8

Output Creep: De-structuring the Curriculum

- Structure requires collective responsibility
- Reducing structure:
  - lowers effective teaching loads
  - mitigates faculty value conflicts
  - increases student choice
- Humanities and social sciences are less structured than science and mathematics

Structure and Costs (Figure 9)

The structure of the curriculum has interesting implications for costs. If you have very low structure, the costs are low and if you have very high structure, the costs are also low. If the structure is in the middle, the costs are high. Why is that?

Let's start with the high end. This is typical of most MBA programs and most law programs. In the MBA program, you can take anything you want as long as it's Accounting I, Accounting II, Finance I, Finance II. It's a lock-step. The same thing is true in law. Everybody marches through. So you can be very efficient. At Stanford Business School, we have 66-person classrooms and there is never an empty seat. We have just the right number of students to fill up five rooms and, bingo, they march right through. The enrollment is always equal to the ideal enrollment which is equal to the size of the classroom.

On the low end, we have the totally free-standing curriculum. No prerequisites, no structure. If the course doesn't fill with the right number of students, you cancel the course. You say, "Take it next quarter or next year." The problem comes with the in-between structure. You have a modest structure. Only ten students sign up but you can't cancel because it means students won't graduate.

Breaking the Ratchet (Figure 10)

So what do we make out of all this? I think it boils down to the question of how you break that ratchet. First we have to start with setting realistic boundary conditions for growth. If this were a private sector audience, I would use the term that Bob Zemsky and I have used extensively, namely, we have to stop cost-plus pricing. Cost-plus pricing is when you add up how much you need and then you sit in a room and set your tuition. If you are a selective private institution, you can get away with that because you are selective anyway (i.e., demand

Figure 9

Most Expensive: Medium Structure With Options

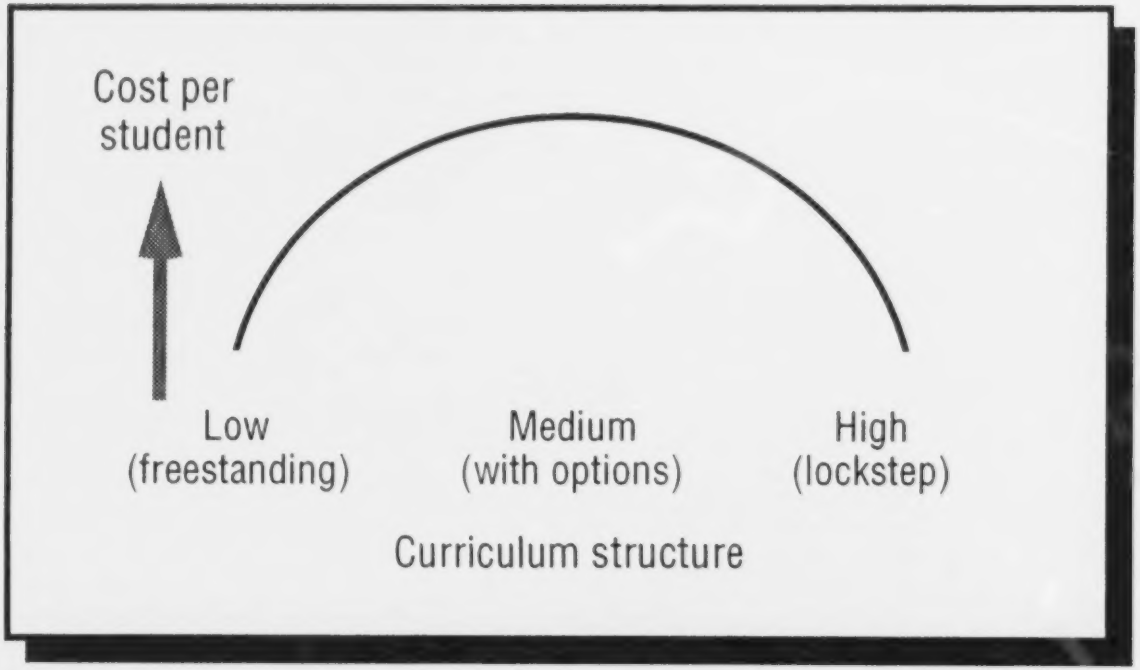


Figure 10

How to Break "The Ratchet"

- Identify realistic boundary conditions for growth
- Spur growth by substitution
- Avoid "freeze-up"

for admissions spaces is greater than supply). People may squawk but they come and they pay it.

We have to get away from that mentality because the growth force says you will never stop adding cost-plus if that's how you're doing it. You have to start with the notion of the budget constraint. Frankly, Bill Bennett has helped us with that, as have the media and others. The pressure is not so much coming from the demand side; it's coming from the media and the political side and our sense of what is right for families. It is not just pure economics by any means.

I am not suggesting that you go to the legislature and say, "Hey, give us the discipline we need to do this, cut our budgets, or put a cap on our funding." That would be crazy, especially given the history of those relatively low increases on average. But whatever it is that you're able to negotiate, you have to then set some realistic boundaries and constraints with the institutions. Only if there is clarity about the boundary conditions will we get any sense of reality. As long as deans, department chairs and faculty think there is hope for add-ons, there is too much force to grow and specialize.

The next thing you have to do is to learn to grow by substitution in order to be responsive. Change and creativity are still important -- one cannot allow institutions to stagnate or ignore changing social priorities. I'm not against real growth if you can get it, but given the boundary conditions that you identify, you need to change and grow by making tradeoffs. The danger is that this strategy can freeze up the institution. You want the growth force to keep operating. What you want to do is operate through substitution; you do not want to have it stop operating. That's what I mean by freezing up. Freezing up is where people give up.

That's not what we want. Things have to move. There is a huge agenda of change that we need, that we rely on faculty and departments to do. So we have to keep the thing

alive. I think of the analogy of a gas. You can constrain a hot gas and have the molecules be very energetic inside that bottle or you can have the same size bottle and have them frozen in a crystalline structure. What we want is to have those molecules bouncing around like crazy. We don't want them frozen in a lattice, but we don't want them exploding the container either.

Necessary Conditions for Change (Figure 11)

There are four necessary conditions for change. First we need strategic thinking. We need to set the agenda and make it alive. Regarding visions, plans, and measures, we tend to put too much emphasis on measures and not enough on visions. A vision is a way to pull the organization toward something. It's more than a goal. It is the sense of what is important, and why it is important.

Then you have to worry about incentives, recognition and rewards. The experience in the business world tells us that the successful corporation that has restructured and changed its direction does not do it from the top. The visions are set at the top after consultation. The incentive structures are set at the top, but the goal is accomplished by empowering groups and individuals to operate in light of that vision and to have something in it for themselves. You can only get this stuff done if you make it possible for the groups and individuals to do it for themselves.

Finally, you need to have firm constraints on available resources because otherwise, once you have empowered individuals, if there are not firm constraints, people will look for and find side doors. What happens, particularly in academic organizations, is that you get a lot of energy going into the business of how to beat the system.

Figure 11

...And The Four Necessary Conditions for Change

- Strategic thinking (visions, plans, measures)
- Incentives, recognition, rewards
- Individual & group empowerment
- Firm constraints on available resources

What SHEEOs Can Do (Figure 12)

What SHEEO can do is to put the notion of growth by substitution on your agenda and build a vision around that. Then you link incentives to that substitution. Avoiding micro-management is the key. With micro-management, the more you try to do it, the more self-defeating it is. The transaction costs are far too high. So you have to find a way to empower institutions. Finally, you have to be as clear as possible about the potential of future resources availability.

When you fudge things in order to get political agreement, you do a disservice to the people down at the grassroots in the system that have to make it happen. If you're talking to a president and there is hope that next year it will be better and you don't have to make the substitution now, that handcuffs you. I know this is a difficult task so I will be interested in your reaction to these proposals.

Figure 12

What SHEEOs Can Do

- Press the vision of growth by substitution
- Link incentives to substitution
- Empower institutions; avoid micro-management
- Be as clear as possible about future resource availability

Reaction

Robert Zemsky

Let me make some overview observations. Because higher education is so diverse, a legitimate question can be raised as to whether the dynamics described by Bill operate differently in other than research universities. I believe they do not.

The departmental research function is now rather uniform across the system. Research productivity drives promotion and tenure in many institutions. And this dynamic is related to cost in very interesting ways. For years I sat in budget discussions at Penn and watched library costs go up and was told every time, "Periodical costs are going up." I assumed that the unit cost per periodical was going up. Wrong. It is because the number of periodicals is increasing. Faculty have been forced to publish more and more, and they have created more and more journals in the process. As you create more and more journals, you create the drive for departmental research on one hand and library costs on the other. This idea of output creep is very real and is very demonstrable and it runs through the entire system. It is very hard to be the one to stand up and say, "Maybe we don't need all of this." But that is what we're talking about. So even though Bill and I have lived our lives at major research universities, I see exactly the same thing everywhere I go.

Second observation: We are focusing on higher education because that's our business. At the same time, however, higher education is part of American society. It is both part of the problem and part of the solution. In the late 1970s I did a study that took me in and out of many corporations; one of them was IBM. I also learned a lot about AT&T, although AT&T was not part of the study. If you spoke to anybody at IBM or AT&T in the late '70s they would have told you they were mean, efficient, cost-effective, that everything was just great. Both of them basically used lab structures to produce their products and you could not

have found anybody at either firm to tell you that there was any other place to do it. You could have searched with a lantern for a decade for a man that knew the truth.

Not until the late 1980s did we discover that what we thought was true was not true at all. Both of these firms have gone through substantial reorganizations. They are both fundamentally different corporations today and it is in part because they had to confront the cost disease that was just as endemic there as it is in higher education. IBM had such a market share that it could simply pass all its costs on. AT&T was regulated, so the higher the cost the more their profit.

We need to talk about higher education in terms of general changes occurring in American business -- leaner, meaner institutions. The two signs of change are an end to cost-plus pricing as a mode of operation and an end to the celebration of employment as the principal measure of wealth. What AT&T has discovered is that it's a lot richer with fewer employees. They've done it in a period when overall employment in the economy went up.

Third observation and a plea: higher education has not been known for truth-telling. Bill has focused on the heart of the enterprise which is really the academic structure. It is this kind of analysis that can make a difference. We're talking about a systemic problem that has to be addressed in part in a larger context. Going back to Bill's notion of freezing up, it cannot be addressed in a way that destroys the vitality of the system. People are going to look increasingly to these institutions to be problem solvers. It is also easy to start a war inside an institution between the academic and the administrative over where the organizational slack exists.

A final comment. We are in the midst of a major discussion in American education about restructuring K through 12. I think the better word is redesign. There is no reason we should not be prepared to talk about a restructuring or redesign of higher education. For example, why are we so locked in to the "course" as a basic building block? What we should

be asking is this: how do you put together learning experiences? If we change the building block structure and break the mold on the curriculum, we would begin to get at the ratchet effect. And if you can get at the ratchet effect, then you also get at the underlying problem of cost-price spiral. This may be the moment in our history when we have to find the internal fortitude to ask basic questions about how this enterprise is put together and do it in such a way that over a period of years we can begin to change the enterprise itself.

Incentives: What Are They?

*SHEEO: It seems that undergraduate teaching and learning is suffering at the expense of research and it pervades all levels. The problem appears to be related to the national mobility of faculty and the national reward system, based purely on how many publications you have. What can we do about this?

Zemsky: You're talking about a national market and it is the research universities that control that market. I think this is an AAU issue. I think you are right that if you don't change the national reward climate, there is very little you can do in a single state system. The only way to change the national reward system is to get major university figures to say teaching is of fundamental importance.

Massy: It is faculty mobility that drives the system. The research universities are national and world treasures but the balance can be shifted a little. It's simply wrong to say that you cannot put relatively more emphasis into teaching without destroying the research end of it. We should be pressing on the tenured faculty, not the non-tenured faculty.

SHEEO: How does the bidding for faculty affect this commitment to research over teaching? Increasingly prestigious research universities are offering great enticements to premier researchers.

Zemsky: We are heading for a faculty shortage and that is very good news because a faculty shortage, even though it will drive up the unit cost of faculty with research degrees, will force us to consider a lot of the things that we have discussed today. We face in this country an enormous crisis in science and math education. We are never going to work out

**The following "conversation" was distilled from an afternoon's discussion between Messrs. Massy, Zemsky and members of the SHEEO Committee on Financing and Accountability. The comments and questions attributed to "SHEEO" come from various members of the committee.*

of this crisis if we assume that the only way to teach science or math at a university level is with somebody with a Ph.D. This is what I mean about changing the structure or redesigning. There are many things that students ought to learn that do not require didactic exchange between a research faculty member and a learner. Calculus is a good example, language another. The skills needed to teach a foreign language are quite different from the skills needed to get a research degree in French literature. Calculus, writing, foreign language should be taught in ways that make the "course credit" irrelevant.

Competency-based education has never received the attention it deserves in major research universities. If it did, it would change the nature of the curriculum and the kind of instructors we employ.

SHEEO: Except you haven't solved the management problem by doing that. No matter how you define a teaching task, if you don't reward faculty the same, they don't have the same perks and they don't have the same kind of salary. Then you have defined the man or woman as inferior in that labor force. Part-timers are a good example.

Massy: Imagine that there is a mathematics department that understands the boundaries of its growth. The faculty understand their objectives. They understand that the people there teaching beginning calculus are not second-class mathematicians because they are first-class teachers of elementary calculus, and they understand it is in the best interest of the institution to have those people around and happy. Understanding the boundary conditions means that it is out of the question to substitute a "real" faculty member -- that is, a monk -- for one of those people. It is in the others' best interests to have the first-rate teacher around. Such an environment would be supportive, quite different than what exists now.

SHEEO: Is there any difference between what you are describing as needed at the collegiate level and what we need from quality high school teachers? Maybe we should be

training collegiate teachers and high school teachers in the same way. More likely, however, faculty shortages will mean expansion of traditional doctoral programs to meet the need.

Zemsky: I agree that new federal and state programs should not be aimed at creating more traditional Ph.Ds. But I think that a person who teaches at the postsecondary level is different than a high school person and that the learning and teaching processes are different. We should get some first-rate mathematics departments to really talk about what it would take up and down the pipeline to increase the quantity and quality of college teachers.

SHEEO: What worries many SHEEOs is that the public, especially parents and legislators, care little about the research function. And if states define that distinction rather clearly, there may be an equally clear response. "Use the taxpayers dollars for teaching and learning. That's what we want our public universities to do and the rest of you guys out there doing research, you're on your own."

States may in fact be the largest funders of research in this country, not the federal government. Do we dare make this explicit? Should we, for example, put this departmental research into a separate pot and make it subject to peer review?

Massy: I think the answer is probably yes, although the process of peer review would have to be a little different than at the National Science Foundation. And by the way, it would also be important to provide symmetry by evaluating teaching.

The lack of information on effective teaching skews incentives and reduces the effort one puts into teaching. We all have anecdotes. The joke when I was assistant professor at MIT used to be that we had plenty of time to prepare for class. My office was on the sixth floor and the classrooms were on the first floor and we had all that time going down the elevator. I really do believe quite modest efforts at improving the quality of teaching and the research universities context would pay dividends. You would not ask someone to apply for every little thing that he/she wants to do, but every so often, every few years, you would

evaluate the person's research stream and you would include in that the non-sponsored research generated. You would then make judgments of the kind that are very hard for monks to make, i.e., that some weren't producing much. Then you would stop making investments in those people's research. So, yes, that's peer group review. But it's not on a project basis, it's on the person's research stream.

SHEEO: Maybe we need also to redefine research productivity. How do we measure economic impact, for example?

Zemsky: Counting citations is certainly better than counting articles, though it, too, is imperfect. I see people going to conferences and reading stuff and basically it's commenting on each other's stuff. And they have to do it to get rewarded so there is really relatively little that is new.

Massy: Another form of peer review is the "fireside chat." This is the dean's talk with the faculty. I used to do it as an associate dean. "Say, look, you're a terrific teacher. We've got some evidence that you may spend more of your time teaching. Maybe there's some way we can help. Would a MacIntosh help?"

Zemsky: Let me try to draw together some things that David Longanecker and Jim Mingle said before. They have suggested that maybe we should separate the instructional departmental research budget. I agree. That just has to be done. It's a start and it has to be done in a way that you do not cheat the departmental research budget. If there's even a smell of that then you will be done in. It may come first to those universities and those systems who most clearly value teaching and research and feel confident enough that they will be able to make the distinction. I think that's the first step, a structural step.

SHEEO: Before you go on, do you know of any places doing this?

Zemsky: No, it's a terrifying thought, absolutely terrifying. But if you're going to get real, that's the place to start getting real.

SHEEO: What about federal policies that would prohibit use of student aid dollars in support of departmental research?

Zemsky: Bad idea. Any institution worth its salt can hire accountants to prove that it doesn't happen.

Massy: One of the problems we have had with this whole discussion today is we have been making the individual faculty member the focus of attention. Let's start thinking that, managerially, the unit of analysis is the department. What we need is a system that can hold a department accountable for the quality of teaching. Provosts and deans need to communicate to departments that they are going to be rewarded or punished according to their teaching as well as their research productivity. Once one has separated the teaching and instructional budget, one can let the dean know that his or her instructional budget will grow along with the department's teaching quality, and that the research budget will grow as the value (not just the quality) of the research grows. And, overall, the pay structure within the department will reflect both of these productivities. So everybody in the unit will benefit if both of these factors go up. Then you will begin to get an environment that allows trade-offs, because the person in research is going to value the person who is helping that revenue stream on teaching. The revenue stream is not just based on numbers of teachers in relation to enrollments -- not just the old enrollment formulas. To make this work, we must have ways of knowing what is good teaching just as we have ways of knowing what is good research. Both the quality and quantity of teaching (and research) must be related to the department's resources and its members' pay.

State Funding Incentives

SHEEO: One of the dilemmas that we face is that the states have chosen to fund graduate education on the backs of undergraduates. Institutions object to mission differentiation because they believe that they cannot afford to run graduate programs without undergraduates to subsidize the system. Even though our funding formulas provide substantially greater amounts of money for graduate students, it is not enough. One solution, suggested by the recent "Commission on the University of the 21st Century" in Virginia, is to give a grants commission control over all new money which would then be distributed according to priorities set by the legislature on the basis of proposals submitted by institutions and faculty.

Zemsky: I had an interesting conversation with a colleague not long ago about how a state might stimulate change. First you announce a five-year contractual program, say, to improve the success of minorities. No institution would be required to participate, but at the end of the program there would be a "prize" of $1 million, unencumbered. Every institution which agrees to participate would be required to supply baseline data on minority student achievement -- admissions data, retention, graduation, job placement, and other performance measures. The institution would pledge to keep this data as long as it is in the competition. Furthermore, each institution would receive a "participation award" of $100,000 annually to cover the costs of participation. But in the end the winner would receive the $1 million dollar prize.

SHEEO: Has anyone implemented the program?

Zemsky: It was a conversation with a colleague at six o'clock in the morning at Kennedy Airport. I'm not responsible for implementation. You are.

SHEEO: Your idea is similar to incentive programs adopted in New Jersey and Connecticut and other states. But yours is more dramatic because of the single prize at the

end. One of the problems with incentive programs has been their marginal nature, politically and financially. They have been a device to gain additional dollars, but have not been acceptable as reallocation strategies. Shouldn't we also be examining the incentives which already exist in our funding formulas?

Massy: I'm no expert on state funding formulas, but it seems to me that they are grounded in the logic of cost-based pricing. Historically, the costs at the graduate level have been high, thus the formula is weighted in this direction.

SHEEO: Public policy is built more around funding needs than rewarding performance, and one of those powerful needs is to fund workload and a natural "entitlement" to inflation growth. If you start funding on the basis of performance, the more effective institution is rewarded, the less effective is not. Soon there will be complaints from constituents of the less effective institution that it is not getting its share of the pie and that is the reason for its ineffectiveness. Many people object to enrollment-driven formulas and incremental budget decisions. But many people, including legislators, are very comfortable with them. Neat systems, based on performance, do not lend themselves to the kind of politics that legislators are used to. Institutional presidents like them because they are predictable sources of revenue. No matter how many things the crazy SHEEO invents, the institution still gets its 5% increment.

Growth by Substitution

SHEEO: In your presentation you suggested that SHEEOs put the notion of growth by substitution on their agenda. How should we do this?

Massy: Let's suppose you have a budget that, at least on a projection basis, is flat in real terms. You decide that you are going to fund that base, but that each year you are going to give it a slight haircut, say 1/2 or 1%, and use the funds to spur substitution. You

say to the legislature, "This money is needed, but it is needed to meet some new priorities." You have a small number of major state objectives and you allocate this money on the basis of institutional performance of these objectives -- including the reallocation of their own funds as well as using your increments. I'm not talking about doling out money for this specific program or that specific program, because that gets you into micro-management. I'm talking about reinforcing behavior which fits with your vision of what needs to be done.

Strategy number two is that you can deliberately build financial incentives into the formula coefficients. Assume that you know what the approximate cost of a Ph.D. program is, and you decide you do not really want this to be a state priority any longer. You set a price formula a little bit below the cost, in order to produce a negative gross margin for the Ph.D. program. In the same way, you could increase the margin for undergraduate programs. You don't hide these differences. Instead, you tell the institutions you are departing from the "cost-based pricing" and moving to "incentive pricing."

SHEEO: Growth by substitution seems to be a hard fact of life to face. One fiction that SHEEOs use is to ignore the substitution issue even though they know in fact that it is occurring. Institutions which ask whether or not incentive funds are add-ons or replacement money may be missing the political point. In Tennessee, which has a performance funding system similar to what we have discussed, the 5% incentive program has become the justification for funding the entire base.

Zemsky: Let me give you another scenario. Recently the Chronicle of Higher Education published a story which said that administrative budgets have grown substantially while faculty size has not grown at all. What would happen if a SHEEO phoned some of the presidents in the state and suggested they bring down their own data on the growth of administration and see how it compared to these national changes? (This data comes from the Equal Employment Opportunity data submitted to the Federal government.)

So now the SHEEO has around the lunch table maybe half a dozen college presidents and they begin talking about the effect of this story on their legislators. And the SHEEO says, "I may be dead wrong but this may actually be more of an opportunity than we recognize. Maybe one of you should cook up an interesting administrative reorganization which I will take to the Governor. Say, we could show an overall 12% reduction in administrative personnel over the next three years." Wouldn't that win you some points with the Governor and the legislature to get done some of the things that need to be done?

SHEEO: The presidents would certainly want to know what they are getting in return for giving up the administrative lines. They would also claim that those administrative lines exist because the state has imposed a great deal of accountability on them. They would want flexibility in return.

Zemsky: One of the problems is that we have accountants checking up on accountants. This happens within systems and even within large complex institutions. Maybe we are going to have to re-institute a certain degree of trust. If we did, we might not need either set of accountants. It will require leadership strong enough to be able to risk trusting the other person.